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# Design of Polymer Semiconductors with Readily Controlled Molecular and Nanoscale Structures for High Performance Printed Organic Electronics

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Polymer semiconductors are enabling materials for printed/organic electronics including flexible displays, smart labels, wearable electronics, solar cells, photodetectors, batteries, and bio/chemical sensors. One key advantage for polymer semiconductors is their readily tunable electronical and optical properties to meet the specific requirements of various applications through a judicious selection of backbone structure, side chain engineering, as well as a control of structural ordering at the nanoscale. The performance of printed/organic electronics have been improving rapidly in the past few years mainly due to the advanced materials design and processing. For example, high field effect mobility of over 10 $cm^2V^{-1}s^{-1}$ for polymer-based organic thin film transistors (OTFTs) and power conversion efficiency of greater than 10% for polymer-based organic photovoltaics (OPVs), which are close to or exceeding the performances of amorphous silicon-based devices, have been achieved. Our group has been working the design and synthesis of new building blocks for polymer semiconductors, which can be used for OTFTs and OPVs. This presentation introduces several important novel building blocks for the construction of high mobility and environmentally stable polymer semiconductors as channel semiconductors for p-type, n-type, and ambipolar OTFTs.